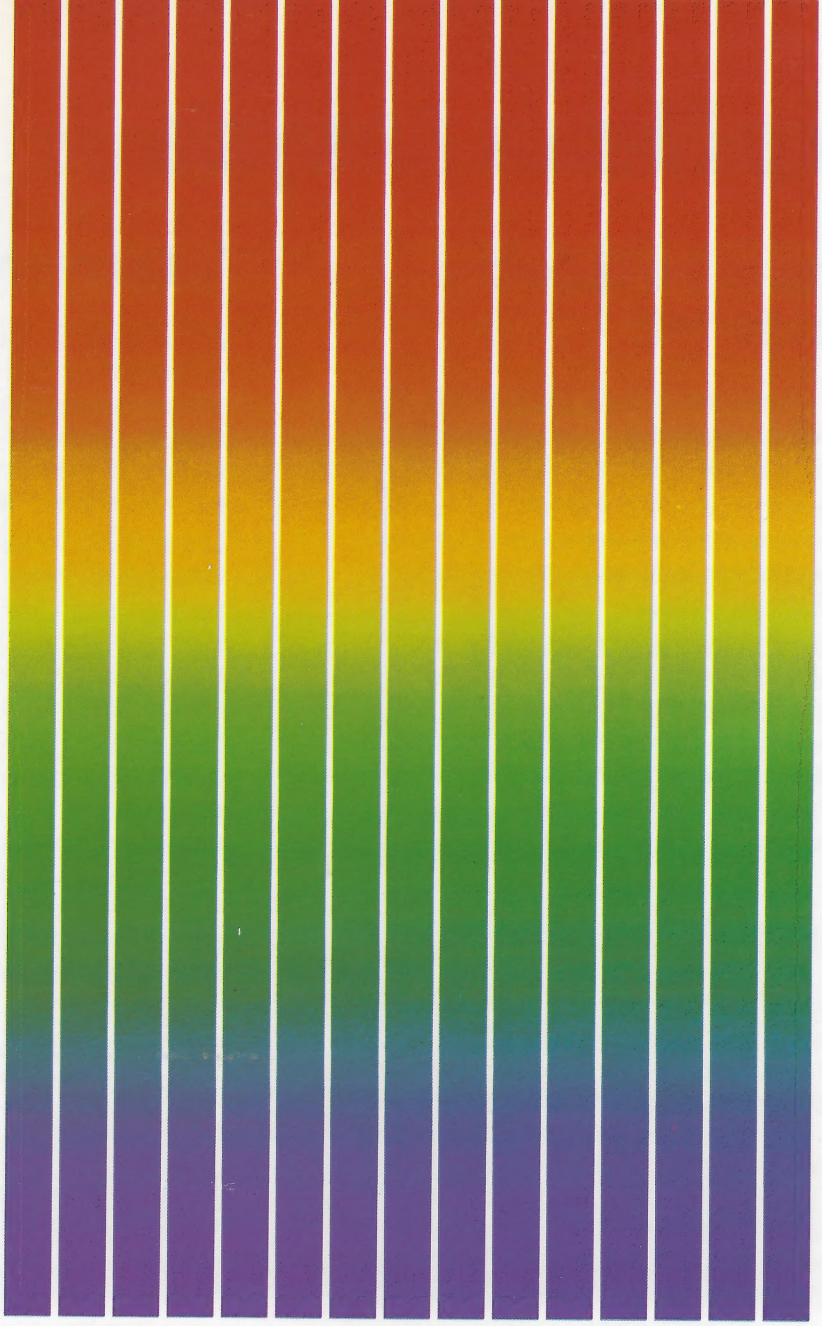


TRACE METALS ANALYZERS

LACHAT
INSTRUMENTS

Trace Metals Analysis

On-line, in the laboratory and in the field

With the Lachat line of Trace Metals Analyzers, over a dozen metals can be accurately determined to as low as 1 part per billion.

They are the *first systems available* to provide on-line and portable determinations of metals — highly practical technology for your everyday applications needs.

Lachat TMA systems are based on the sensitive and well-proven technique of anodic stripping voltammetry (ASV). They offer a unique solution to the determination of low level metals in discharge and drinking waters and, with dilution, high level metals in plating bath solutions.

Precision ASV technology

ASV is actually electroplating on a micro-scale. In this technique, metals are plated from a standard or sample solution onto an electrode for a given period of time by applying a negative potential to the electrode. Following plating, the potential is reversed and, as it is ramped positively, the deposited metals are reoxidized or stripped back into the solution. This occurs at a specific voltage for each metal, generating a current, the magnitude of which is directly proportional to the concentration of the metal. Figure 1 shows a sample voltammogram.

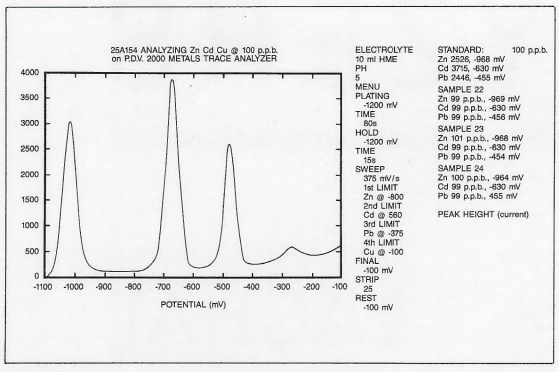


Fig. 1

Voltammetry that's practical

ASV is unsurpassed for accuracy, precision and sensitivity. But until now, it has been a difficult technique to use in an applied analytical laboratory. As implemented with the Lachat TMA systems, however, ASV has now become rugged, reliable and easy to use.

Classical ASV uses a dropping mercury electrode (DME) which requires a complex supporting design that includes a reservoir of toxic mercury, a glass capillary to deliver the mercury drops, and deoxygenation of the sample using a nitrogen purge.

Lachat TMA greatly simplifies this technique. The DME is replaced with a glassy carbon electrode that is automatically coated with a thin film of mercury, eliminating the need for a mercury reservoir and capillary. Also, there's no need for a nitrogen purge since deoxygenation occurs chemically by adding a reducing agent, such as ascorbic acid, to the sample.

High sensitivity

Detection limits of 1 ppb for cadmium, copper, lead, zinc, tin, thallium and bismuth are easily obtained with the Lachat TMA systems. For metals that will not plate onto a mercury coating—such as gold, silver and mercury itself—a detection limit of 50 ppb is characteristic.

Dynamic range

As shown in Figure 2, calibration curves are rectilinear over a wide concentration range for all elements amenable to stripping voltammetry. As a result, only one standard is required for calibration and the method can be employed for concentrations up to 1,000 ppb. For higher ranges, standard voltammetry can be used without the plating step required for preconcentration.

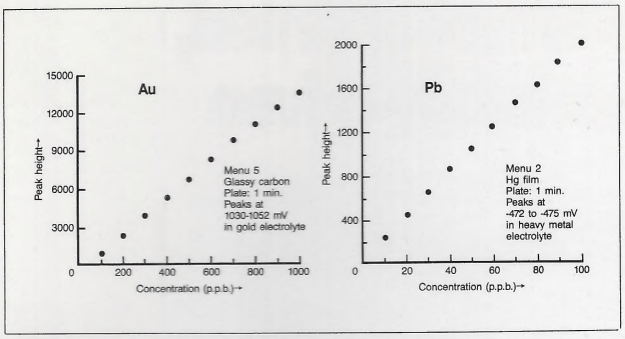


Fig. 2

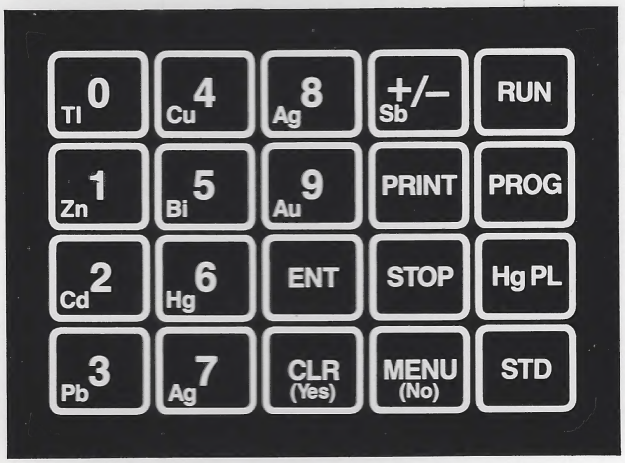
Simultaneous determinations

In some cases, several metals can be stripped in sequence during the same analysis. For example, zinc, lead, cadmium and copper can be plated and stripped using a voltage ramp from -1100 mV to -200 mV.

Efficient keyboard

With Lachat TMA systems, all operations are microprocessor-controlled through a 20-position keyboard, as shown in Figure 3. All analytical parameters are established through the keyboard, including plating time, scan rate, and both initial and final stripping potentials. Up to eight operating programs can be stored for immediate recall, eliminating the need to input analytical parameters for each run.

Fig. 3



Cd 137 p.p.b. Pb 64 p.p.b.

Cu 1004 p.p.b.

Ergonomic cell design

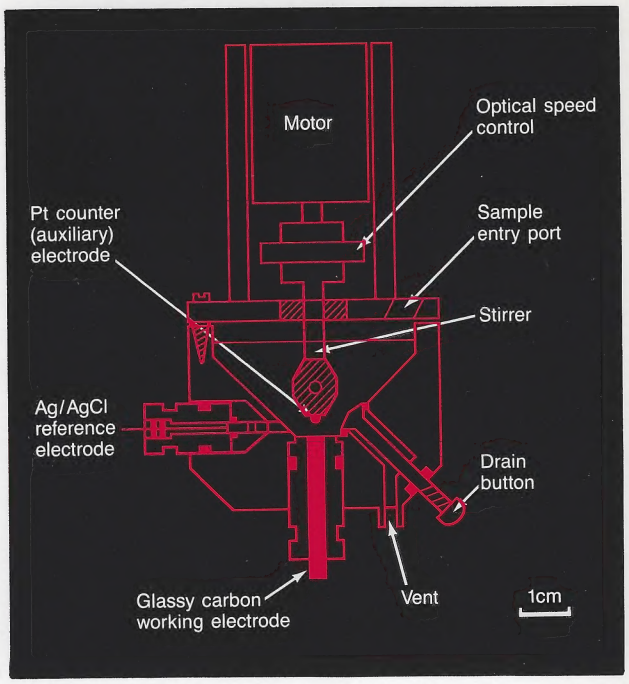


Fig. 4

The Lachat TMA systems feature a cell design* (Figure 4) that is optimized for ease of use:

- Electrodes remain undisturbed during sample insertion and rinsing procedures, and the working electrode is covered with a small volume of liquid at all times.
- The mercury film plated onto the electrode can be used for several days. When replating is needed, the system does it automatically.
- A push-button or solenoid-driven drain provides easy drainage of cell contents so that the cell need not be removed or disassembled between samples.

Reliable on-line voltammetry

The Lachat systems make on-line voltammetry an exceptionally reliable tool for continuous monitoring—whether you're analyzing discharge waters against NPDES permit limits, drinking water for NIPDWR monitoring or a plating process for quality control.

*Patent pending

Lachat TMA systems are the only systems that allow either on-line or portable determinations of metals. Classical technologies—atomic absorption spectrometry, inductively coupled plasma spectrometry and DME voltammetry—are simply too complex to operate reliably in an on-line or portable mode.

Simplicity of design is the key. The only moving parts on a Lachat system are one pump and a set of five solenoid stream-switching valves. As a result, maintenance is minimal. Also, consumption of reagents and standards is so low that replenishment is required only once a month.

From the lab to the field

Lachat systems offer a sophisticated yet compact solution to your analytical problems with technology that performs as well in the field as it does in the laboratory:

- For field use, the TMA and its accessory items fit into a lightweight, rugged case for easy portability.
- In the laboratory, you can use the same instrument—and even enhance it with an advanced PC-based software package.

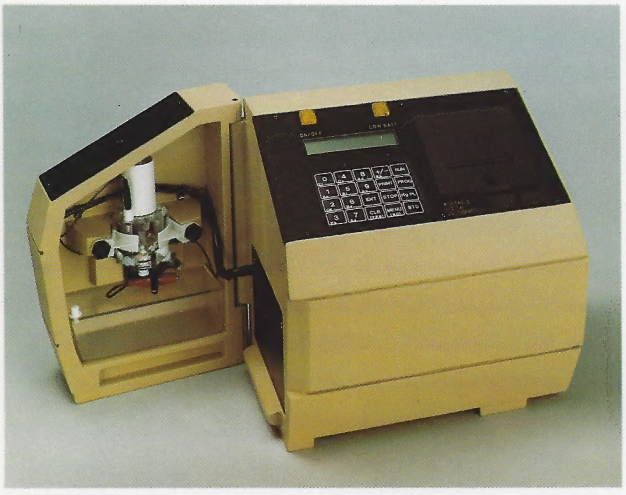


Fig. 5 Portable system

Solving the tough problems

Lachat is committed to providing you with the practical technology—*and extensive applications support*—that help you solve the analytical problems you face. Consider, for example, our in-depth library of applications notes. The following are just a few of the tough analytical problems that we're ready to help you with:

- Lead, cadmium and copper in drinking water
- Lead, cadmium and copper in discharge waters
- Zinc and lead in process liquors
- Lead in gasoline
- Cadmium in marine life
- Lead, copper and bismuth in rocks and soils
- Gold in rocks and soils
- Gold in cyanide liquors
- Lead, cadmium and copper in foodstuffs
- Lead, cadmium and copper in solid zinc and steel

See for yourself

We'd like you to know more about our Trace Metals Analyzers. For additional information, return the attached postage-paid card or call us toll-free:

(800) 247-7613

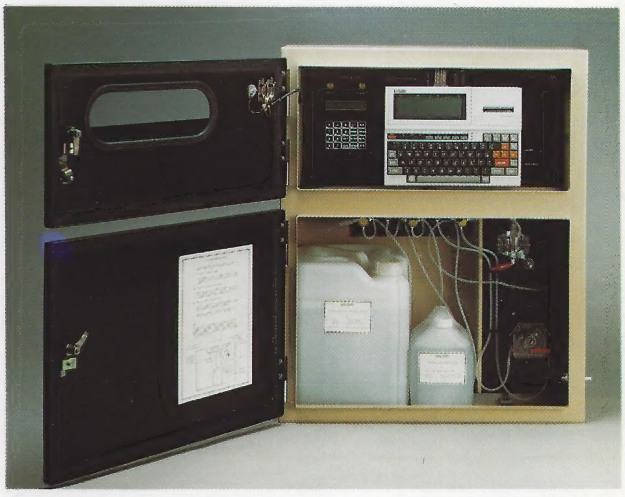


Fig. 6 On-line system

TRACE METALS ANALYZERS

ELECTRONIC

Supply voltage:	Internal, 24V battery. External, 11V to 30V DC. AC charger supplied.
Electrode voltage range:	-2V to 2V DC.
Current measurement:	12 Bit A/D converter. Auto-ranging. Resolution 1 part in 65535.
Display:	2 line, 20 characters liquid crystal.
Keyboard:	20 key, waterproof, diaphragm type.
Printer:	24 column impact dot matrix.
Communications:	RS 232C serial port.

CELL

Material, volume:	Acrylic, 10mL capacity.
Working electrode:	Polished glassy carbon.
Reference electrode:	Ag/AgCl.
Auxiliary electrode:	Pt wire.
Draining system:	Plunger and vent.
Stirrer:	DC motor driven, centrifugal.

OPERATIONAL

Technique:	Anodic Stripping Voltammetry (staircase wave form).
Software control:	8 menus × 16 parameters, fully programmable.
Microprocessor:	All steps fully controlled by 8085 microprocessor.
Calibration:	Facility for chemicals standardization. Output in parts per billion (p.p.b.).

OPTIONS

21 component standards kit, 2 pipettes, electrolytes for analysis.
100-unit automatic sample handler.
Graphic Display Module (for full curve output).
IBM® compatible software.
Portable Bottle Roller, digestion chemicals.

ANALYTICAL

Element[1]		Lower Limit of Detection[2]	Upper Limit of Detection[3]	Coefficient of Variation[4]
Antimony	(Sb)	10 p.p.b.	1000 p.p.b.[5]	5%
Arsenic	(As)	10 p.p.b.	4000 p.p.b.	5%
Bismuth	(Bi)	1 p.p.b.	2000 p.p.b.	2%
Cadmium	(Cd)	1 p.p.b.	2000 p.p.b.	2%
Copper	(Cu)	1 p.p.b.	2000 p.p.b.	2%
Gold	(Au)	50 p.p.b.	4000 p.p.b.	5%
Lead	(Pb)	1 p.p.b.	2000 p.p.b.	2%
Mercury	(Hg)	30 p.p.b.	6000 p.p.b.	5%
Thallium	(Tl)	1 p.p.b.	2000 p.p.b.	2%
Zinc	(Zn)	1 p.p.b.	2000 p.p.b.	2%
Other Elements				
Indium	(In)			
Manganese	(Mn)			
Silver	(Ag)			
Selenium	(Se)			
Tin	(Sn)			

1. All limits approximate, in cell solution, for a 60 sec. plate
2. Ultimately depends on plating time and purity of electrolyte.
3. Samples more concentrated can be handled by dilution.
4. Coefficient of variation at approximately mid-range concentration.
5. 1000 p.p.b. = 1 mg/L.

Lachat Instruments: customer-oriented, technology-driven

Lachat Instruments has been designing continuous-flow ion analyzers for a decade. In 1978, our first injection-based system was introduced—a system which has evolved into the QuikChem Automated Ion Analyzer.

As an industry innovator, our emphasis is on developing the finest technology to meet your applications. At the same time, we're a company committed to providing the best service and support possible. From our Applications Support Group to our Customer Service Department, Lachat people are accessible and responsive to your needs.

And that's something you can count on. Because no matter how advanced our technology gets, our priorities remain quite simple—you come first.

For more information about Lachat Instruments and our products for automated ion analysis, please call us or use the enclosed reply card.

LACHAT
INSTRUMENTS

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Telex 26-9681

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YES, I'm interested in the Trace Metals Analyzers and would like:

☐ a Lachat representative to contact me.
☐ to arrange for a seminar to see these systems in action.
☐ to discuss my analysis needs with your company.
☐ to be added to your mailing list.

Name _____

Title _____

Company _____

Dept. _____

Address _____

City _____ State _____ Zip _____

Phone _____

For further technical and price information on the Trace Metals Analyzers from Lachat, please complete and return the attached, postage-paid card. We will respond with application notes and a price list.

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